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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/608,948	06/26/2003	Valery M. Dubin	42P14493	8275
8791	7590	12/15/2004	EXAMINER	
BLAKELY SOKOLOFF TAYLOR & ZAFMAN 12400 WILSHIRE BOULEVARD SEVENTH FLOOR LOS ANGELES, CA 90025-1030			MENZ, DOUGLAS M	
			ART UNIT	PAPER NUMBER
			2824	

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/608,948

Applicant(s)

DUBIN ET AL.

Examiner

Douglas M Menz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 6/26/03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: Search History.

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election without traverse of Group I, claims 1-8, in the reply filed on 11/1/04 is acknowledged.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 and 6-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Buynoski (US 6667552).

Regarding claim 1, Buynoski discloses an apparatus comprising:

a first layer (*metal 1*) having a first at least one interconnect (*left side*) formed in an interlayer dielectric (Fig. 1 and Col. 6, lines: 20-35);

a second layer (*metal 2*) formed over the first layer, the second layer having a second at least one interconnect (*left side*, Fig. 1 and Col. 6, lines: 20-35);

a third layer (*metal 3*) formed over the second layer, the third layer defining at least one air gap (20) between the second at least one interconnect and the third layer; and at least one shunt (*via 1*) selectively covering the first and second at least one interconnects (Figs. 1-2 and Col. 6).

Regarding claim 2, Buynoski further discloses comprising a barrier layer (30) to support the first and second at least one interconnects (Figs 3-4 and Col. 6, lines: 40-50).

Regarding claim 3, Buynoski further discloses wherein the barrier layer has a thickness of 500 Angstroms (Col. 7, lines: 44-46).

Regarding claim 6, Buynoski further discloses wherein the second layer (*metal 2*) comprises a first sublayer (*under metal 2*) and a second sublayer (*over metal 2*), the first sublayer (*under metal 2*) is between the first layer (*metal 1*) and the second sublayer (*over metal 2*), and the second sublayer (*over metal 2*) is between the first sublayer (*under metal 2*) and the third layer (*metal 3*), the first sublayer (*under metal 2*) comprising an ILD (Fig. 1), and the second sublayer (*over metal 2*) comprising air (20, Fig. 3).

Regarding claim 7, Buynoski further discloses wherein the second at least one interconnect is within the second sublayer (Figs. 1-2).

Regarding claim 8, Buynoski further discloses wherein the second layer (*metal 2*) comprises air (*metal 2 is dispersed between air pockets 20, Fig. 2*).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buynoski (US 6667552) in view of Dubin et al. (US 6696758).

Buynoski discloses the apparatus of claim 1 as mentioned above and further discloses at least one via having a vial plug (*via 1, Fig. 1*), however, Buynoski does not

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explicitly disclose further the via plug material is selected from the group consisting of cobalt and nickel or that the vial plug is deposited using electroless deposition.

Dubin discloses an interconnect structure which incorporates a via plug material that is selected from the group consisting of cobalt and nickel (Col. 5) and that the via plug is deposited using electroless deposition (Col. 7). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a via plug material that is selected from the group consisting of cobalt and nickel and that the via plug is deposited using electroless deposition with Buynoski's structure for the purpose of improving the structural properties of the interconnect structure as taught by Dubin (Col. 2).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following US patents all disclose interconnect structures which incorporate air gaps as dielectrics: 5413962, 5708303, 5900668 and 5953626).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas M Menz whose telephone number is 571-272-1877. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DM



MICHAEL S. LEBENTRITT  
PRIMARY EXAMINER